Chapter 42
Sharing Medical Information by Means of Using Intelligent Agents and Cloud Computing

Mauricio Paletta
Universidad Nacional Experimental de Guayana, Venezuela

ABSTRACT

From birth to death, every human being leaves a long medical history consisting of laboratory exams, records of medical consultations, records, and hospitalizations, as well as any other important information that affects the patient's health. These are known today as Electronic Health Records (EHR) or Electronic Medical Records (EMR). However, because a person's lifestyle and health are continuously changing, most of this medical information is distributed among different institutions, cities, and even countries where the specific processes were undertaken, in possession of health insurance providers or even hidden inside a drawer of the patient's home. Therefore, aiming to enhance the availability of improved medical services at reduced costs, modern information technology is being increasingly used in the healthcare sector. Researchers, developers, and companies have made efforts to develop mobile, Web, desktop, and enterprise e-health applications raising the importance of interoperability and data exchange between e-health applications and Health Information Systems (HIS). In this regard, Cloud Computing (CC) promises low cost, high scalability, availability, and disaster recoverability, which can be a natural solution for some of the problems faced in storing and analyzing EMRs. However, CC, which is mainly defined to address the use of scalable and often virtualized resources, is still evolving. New, specific collaboration models among service providers are needed for enabling effective service collaboration, allowing the process of serving consumers to be more efficient. In this chapter, the current state and trends of CC in healthcare are presented as well as a detailed collaboration model based on intelligent agents focusing on the EHR sharing subject. This model for enabling effective service in cloud systems is based on a recent research proposal related to defining a collaboration mechanism by means of Scout Movement. The chapter also includes details on the way in which services and service providers are clearly defined in this particular system.

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INTRODUCTION

Imagine a situation in which a patient's complete medical history is available online. If so, then for example every time a person takes a laboratory exam the institution would register the results online, making them available for every physician or hospital that examines the patient so they would upgrade the patient's medical information, and so on. If this could be possible, then a patient's medical information could be accessible anytime and anywhere it might be needed, either by doctors or health care facilities as well as by the patient him/herself. In this scenario then, if a patient needs to visit a new doctor, for example, or a specialist, then the first thing the doctor could do is to take a look to the patient's medical information online instead of asking routine questions like: Have you ever had any major surgeries? Can you tell me anything about your family history? Do they take any medication? Are you on any medication? And so on. Also notice that a patient can be better helped if the patient's relative medical information is easily accessible online. In the event of a fatality, moreover, the information would continue to be stored online to help relatives.

Furthermore, it is interesting to consider what happens to a patient's laboratory results taken during his or her lifetime. What happens to these results? Could these results be stored somewhere where they might be accessible at any time by both the patient and the physician or healthcare provider? Could these results be organized into graphics or charts that could, for example, show how the patient's cholesterol levels have evolved over time?

According to Wilson (2012), "The healthcare industry has traditionally underutilized technology as a means of improving the delivery of patient care. Even today, organizations still rely on paper medical records and handwritten notes to inform and make decisions. Digital information is siloed between departments and applications, making access to a patient's longitudinal record difficult, if not impossible. This lack of access costs the healthcare industry millions of dollars each year in duplication and waste" (p. 4). In the same order of ideas, Kuo (2011) states that "Health care, as with any other service operation, requires continuous and systematic innovation in order to remain cost effective, efficient, and timely, and to provide high-quality services" (p. e67). Moreover, "One of the areas with greatest needs having available information at the right moment and with high accuracy is healthcare. Right information at the right time saves lives" (Lupşe et al., 2012, p. 81).

Because the healthcare industry specifically is under significant pressures to lower the costs associated with providing their services, this idea of sharing Electronic Health Records (EHR) or Electronic Medical Records (EMR) is not new. However, "the ability of healthcare providers to adopt new technologies that drive better patient care has always been a challenge, born out of the cost and complexity of rolling out new technologies" (Wilson, 2012, p. 10).

An EMR is a computerized legal medical record (patient record) created in an organization that delivers care. It has three parts (Li et al., 2010):

1. **The Patient's Data:** Basic information of a patient: name, address, date of birth, insurance information, and so on.
2. **The Patient's Profile:** Summary of a patient's family history as well as details of the patient's life style.
3. **The Clinical Data:** Information related to symptoms, diagnosis, and treatment of each of a patient's medical cases.

Due to the fact that a patient' EMR can be distributed between hospitals, research clinics, private health care institutions, doctors/physician, insurance companies, pharmacies, laboratories, imaging centers, and even the same patient, it sounds reasonable then to maintain the information in a distributed environment. Another possible option to consider could be centralization but it